

**Educational differences in likelihood of attributing breast symptoms to cancer:
A vignette-based study**

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ABSTRACT

Background

Stage at diagnosis of breast cancer varies by socio-economic status (SES), with lower SES associated with poorer survival. We investigated associations between SES (indexed by education), and the likelihood of attributing breast symptoms to breast cancer.

Method

We conducted an online survey with 961 women (47-92 years) with variable educational levels. Two vignettes depicted familiar and unfamiliar breast changes (axillary lump and nipple rash). Without making breast cancer explicit, women were asked 'What do you think this [...] could be?' After the attribution question, women were asked to indicate their level of agreement with a cancer avoidance statement ('I would not want to know if I have breast cancer').

Results

Women were more likely to mention cancer as a possible cause of an axillary lump (64%) compared with nipple rash (30%). In multivariable analysis, low and mid education were independently associated with being less likely to attribute a nipple rash to cancer (OR 0.51, 0.36-0.73 and OR 0.55, 0.40-0.77, respectively). For axillary lump, low education was associated with lower likelihood of mentioning cancer as a possible cause (OR 0.58, 0.41-0.83). Although cancer avoidance was also associated with lower education, the association between education and lower likelihood of making a cancer attribution was independent.

Conclusion

Lower education was associated with lower likelihood of making cancer attributions for both symptoms, also after adjustment for cancer avoidance. Lower likelihood of considering cancer may delay symptomatic presentation and contribute to educational differences in stage at diagnosis.

BACKGROUND

Breast cancer is the most common cancer among women in the United Kingdom (UK) [1], and there are known socioeconomic inequalities; women from lower socioeconomic backgrounds are more likely to be diagnosed at a later stage, and have lower survival [2, 3]. It has been estimated that if it were possible to eliminate socioeconomic inequalities in stage at diagnosis, 450 deaths in women with breast cancer would be prevented within 5 years from diagnosis [4].

Based on models of help seeking behaviour [5, 6], differences in how women experience, interpret (appraisal) and react (help-seeking) to breast cancer symptoms is considered one key route to this observed inequality [7]. However, evidence exploring differences in how women make decisions about breast cancer symptoms is scarce. One such study based on vignettes found that women with lower socioeconomic position were 60% more likely to report immediate medical help-seeking compared to women from higher socio-economic backgrounds [8]. It was suggested that inequalities may occur at the level of health care provision [8]. However, epidemiological evidence from women with breast cancer suggests no evidence of inequalities in promptness of referral after presentation (the length of the primary care interval for women with breast cancer is in any case trivial, median 0 days, IQR 0-1 days), focusing attention on the importance of the pre-presentation interval [7, 9].

The Model of Pathways to Treatment divides the patient interval (i.e. time from first experiencing a bodily change to first consultation with a healthcare professional) into appraisal and action parts [5, 10], and people construct representations of illness which guide their coping responses [11]. These symptom representations comprise several components including identity (interpretation of symptom as associated with illness) and cause (likely cause of the illness). In the breast cancer literature, patient delay in general has been related to the experience of non-lump (i.e. unfamiliar) symptoms, and by attribution of symptoms to causes other than cancer [12-14]. This suggests that overall inequalities in the patient interval may be particularly concentrated in the appraisal interval component, and may be different for familiar versus unfamiliar symptoms.

Previous research suggested that people from lower SES backgrounds may have lower knowledge of cancer warning signs [15, 16], or are less likely to consider cancer as a possible

cause when they experience ‘alarm’ symptoms in everyday life [17]. Studies indicate that processes involved could include higher levels of cancer avoidance [18, 19], higher levels of cancer fatalism [20], or wider physical, political and social issues in people from lower socioeconomic backgrounds [21, 22]. Recent evidence from cancer patients reported socio-demographic differences in symptom attributions, with patients from lower educational levels more likely to attribute their most important symptom to psychological causes [23].

There has been little exploration of socioeconomic differences in breast symptom appraisal (how women notice and make sense of breast related symptoms). We employed two vignettes describing a familiar (lump) and an unfamiliar (rash) breast cancer symptom to control for symptom familiarity as a potential driver of cancer attributions. Given that prolonged help-seeking intervals have been associated with unfamiliar symptoms [11-13], we hypothesised that fewer cancer attributions would be made for the unfamiliar symptom compared to the more familiar symptom. We hypothesised that women with higher education would be more likely to attribute a nipple rash to cancer than women from lower educational backgrounds, but as ‘lump’ is a well-recognised symptom of breast cancer we would not find an educational difference in attributing a lump to cancer.

METHODS

Study design

A cross-sectional vignette survey was conducted online with 1000 women in the UK in June 2015 with the help of a specialist recruitment agency (Survey Sampling International, SSI). One vignette described a familiar symptom of breast cancer (axillary lump or lump in the armpit), while the second, an unfamiliar one (rash on the nipple).

Vignette development

The two signs/symptoms were chosen based on findings from the Breast Cancer Awareness Measure, which showed that most women recognised lumps in the armpit as a warning sign of breast cancer (71%) but few nipple rash (14%) [24]. We did not include ‘breast lump’ as we aimed to mask the breast cancer context as much as possible [25].

The vignettes (Box 1) were based on previous literature [8, 26], and piloted in cognitive interviews [27]. We asked 10 women in cognitive think aloud interviews about their

impressions of the vignettes and whether they understood the questions. The vignettes were then tested in focus groups, which were conducted by AM at the University of Surrey with women from a) lower educational backgrounds (N=6), b) middle educational backgrounds (N=6) and c) higher educational backgrounds (N=7). Two focus groups were recruited from community settings, and the group of lower SES women was recruited with the help of a qualitative research company (Saros Ltd.). The women (aged 49 to 83 years) were asked to assess comprehension (e.g. does this scenario make sense to you?), and believability (can you imagine yourself in this scenario?)

Piloting confirmed that nipple rash was considered an unfamiliar symptom of breast cancer, while axillary lump was familiar. Refinements included changing the tense to the second person singular (you) instead of using a character. We removed a sentence that implied delay in acting upon symptoms ('two weeks later the lump was still there'). We soft launched the survey with 106 women and these preliminary responses indicated that the data was credible and we continued to the full survey with no further changes.

Box 1 Vignettes for nipple rash and axillary lump.

One morning, while having a shower, you notice a red scaly rash on your left nipple [a small lump in your armpit]. You are not sure if there is anything unusual about the rash [the lump]. You check the other nipple [armpit] and it looks [feels] fine. Apart from this change, you have not noticed anything about your body that is different from usual.

Setting and participants

The vignette survey was programmed online by the recruiting agency (SSI), and emailed to members of their online panel, with the aim of recruiting 1000 complete responses. We purposefully sampled participants to vary by education level (no formal qualifications, education below university level, university degree or higher), as education is an important component of socioeconomic status (SES) in older adults [28]. The main reason for using education is that education level is fixed relatively early in life and it constitutes an antecedent of other SES indices such as employment status or income level [27].

We included women aged 47-92 years without a current diagnosis of breast cancer and who wanted to participate from the initial screener questionnaire. Participants were asked in the screener questionnaire, 'Do you have a current diagnosis for any of the following conditions/illnesses?' and to tick all that applied from a list that included: arthritis, cancer, circulation problems, chest problems, cholesterol problems, depression, diabetes, heart problems, high blood pressure, stroke, kidney problems and 'other'. Women ticking 'cancer' were excluded from the online vignette survey.

Of the people completing the initial screener questionnaire (n=1402), 16.8% (n=235) were excluded for being younger than 47 years of age, having a current diagnosis of breast cancer, or not being interested in taking part in the study. The most common reasons for declining to take part were lack of interest in a health-related topic, the private nature of the questions, and not having time. Of the 1167 who started the survey, 167 (14.3%) provided incomplete answers. The final sample consisted of 1000 participants who met the inclusion criteria and completed the survey in full. The final sample did not contain any respondents that completed the survey in under 30% of the median length of the survey completion time ('speeders'), nor any missing data as all the questions were 'forced response.' Debriefing information was displayed at the end the survey including contact details of the research team if the participants had any questions or wanted further details about the study.

The study was approved by University of Surrey Research Ethics Committee (EC/2014/117/FHMS).

Measures

Symptom attribution. Participants were presented with the two scenarios in randomised order (Box 1). Symptom attribution was measured with free-text responses to the question 'What do you think this nipple rash could be?' The participants were invited to write down as many explanations as they could think of, or 'don't know' if they could not think of any.

Cancer avoidance (from Awareness and Beliefs about Cancer Measure) [ABC: 29]. We included a measure of cancer avoidance based on evidence that it is associated with socioeconomic status [18], and may be a potential confounder in the relationship between education and likelihood of considering cancer [17]. After completing the vignette,

participants were asked their level of agreement to the statement, '*I would not want to know if I have breast cancer*' on a five point Likert scale from strongly agree to strongly disagree.

Demographics. Women were asked their age (in years), ethnic group (White British, White Irish, Other White background, Indian, Pakistani, Bangladeshi, Black Caribbean, Black African, White Asian, Chinese, White & Black Caribbean, White & Black African and Other), highest level of education (degree or higher, higher education below degree level, A Levels, ONC/BTEC, O Level/GCSE, no formal qualifications), marital status (single/never married, married/living with partner, civil partnership, divorced/separated/ widowed), and employment status (employed full-time, employed part-time, unemployed, self-employed, full-time homemaker, retired, studying, disabled or too ill to work).

Statistical methods

Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) 22.0 [30]. Descriptive statistics were completed for demographics, symptom attributions and cancer avoidance. Demographics were categorised into age groups (47-59; 60-69, 70+), education (*higher education* = degree or higher; *mid education* = higher education below degree level; A Levels; ONC/BTEC; O Level/GCSE; *lower education* = no formal qualifications), ethnicity (*White*=White British, White Irish. Other White and *Other*=all other categories), marital status (*married/cohabiting*= married/living with partner, civil partnership and *not married*= all other categories) and employment (*working*= employed full-time, employed part-time, self-employed and *not working*=all other categories).

For symptom attributions and cancer avoidance we weighted the data by education to adjust for over/under representation of education levels compared to the general population. We used CENSUS 2011 data [31] to create a weight variable, where population estimates were 23% for higher education (weight =0.70), 39% for mid education (weight=1.18) and 38% for low education (weight =1.15) respectively.

Responses to the open attribution item were coded into 'physical', 'external/normalising', 'psychological' or 'cancer' in line with our previous research [25]. Don't know responses were counted separately. If participants made more than one attribution (e.g. cancer, eczema), we coded each attribution separately. Cancer attributions were coded by an additional coder

(KLW), and revealed high agreement in coding mentions of cancer (Cohen's Kappa >0.90) [32].

For cancer avoidance, women scoring 1 or 2 (i.e. strongly agree or agree) were categorised as 'Agree', women scoring 3 were categorised as 'neither agree nor disagree' and women scoring 4 and 5 (i.e. disagree or strongly disagree) were categorised as 'Disagree'.

Associations between other demographic characteristics, cancer avoidance and likelihood of attributing nipple rash and axillary lump to cancer were explored with univariable logistic regression. The association between education and likelihood of making cancer attributions were estimated with multivariable logistic regression controlling for demographic characteristics and cancer avoidance. Employment status was not included in logistic regression models because education is considered an antecedent of employment [27]. As the unadjusted odds ratios were similar to the adjusted odds ratios, we present adjusted odds ratios only.

RESULTS

Participants

Of the 1000 participants, 39 (3.9%) had experienced breast cancer in the past and were excluded from the analyses. The majority of women were White British (95%) and were not working (67%). Women in the lower education category were older than women in the mid and higher categories ($p<.001$) and less likely to be employed ($p<.001$) (Table 1).

Pattern of overall attributions by symptom type

Most women made one attribution for nipple rash and lump and the number of attributions women made for each symptom ranged from 0 to 3. Table 2 presents the types of attributions made by symptom type.

Overall, 30% of women mentioned cancer as a possible cause of a nipple rash compared with 64% of women mentioning cancer as a possible cause of an axillary lump in weighted analyses. Axillary lump was more often associated with non-cancer physical causes (e.g. cyst, swollen glands due to infection) (64%) compared with a nipple rash (37%).

Cancer avoidance

In the weighted analysis, 7% (61/867) of women agreed that they would not want to know if they had breast cancer. Low education (OR 2.19, 1.06-4.52) and mid-education (OR 2.24, 1.05-4.77) were associated with being cancer avoidant compared with higher education (Table 3).

Socio-demographic associations with likelihood of making cancer attribution

Nipple rash

Women with low education (OR 0.51, 0.36-0.76) or mid education (OR 0.55, 0.40-0.77) were less likely to mention cancer as a possible cause than women with higher education. For cancer avoidance both endorsing 'neither agree nor disagree' (OR 0.49, 0.29-0.83) or 'agree' (OR 0.44, 0.22-0.90) was associated with being less likely to mention cancer for the nipple rash scenario (Table 4).

Axillary lump

Women with low education (OR 0.58, 0.41-0.83) were less likely to mention cancer as a possible cause than highly educated women (Table 4). Older (OR 1.41, 1.03-1.92) and white women (OR 2.93, 1.56-5.52) were more likely to mention cancer than younger women and women from non-white ethnic backgrounds. For cancer avoidance, endorsing 'neither agree nor disagree' was associated with being less likely to mention cancer for the lump scenario (OR 0.57, 0.37-0.86).

DISCUSSION

Main findings

In the present study, women aged 47-92 years were more likely to mention cancer as a possible cause of an axillary lump (64%) compared with nipple rash (30%). Lower education was associated with being less likely to mention cancer as a possible cause of both the axillary lump and nipple rash scenarios, despite our hypothesis that we would only see educational differences in attributions for the less familiar breast cancer symptom. Lower education was also associated with cancer avoidance, but including cancer avoidance in multivariable models did not materially alter the associations between education and likelihood of considering cancer for either symptom scenario examined.

Comparison with literature and discussion of findings

The findings that women were more likely to consider cancer in response to a lump vignette compared to a nipple rash vignette mirrors findings from the Breast Cancer Awareness Measure, where axillary lump is the most well recognised breast cancer symptom after breast lump, whilst nipple rash is much less known [24]. The finding that women with less education were less likely to mention cancer in response to both scenarios suggests that socioeconomic differences in symptom appraisal may apply for well-known and lesser-known symptoms. This supports our previous research in a community-based sample of men and women, where lower education was associated with lower likelihood of mentioning cancer across a range of cancer ‘alarm’ symptoms [17]. Educational differences in likelihood of mentioning cancer also suggests that inequalities occur earlier than at the level of health care provision, in contrast to claims from previous research [8]. However, we can’t directly compare our findings with Adamson et al because their outcome was help-seeking, whilst ours was likelihood of making a cancer attribution.

Our finding that cancer avoidance was more common in the lower educated groups supports previous research [18, 19], and demonstrates that when this generic item is adapted to focus on ‘breast’ cancer, the same findings emerge. A key finding was that the association between education and likelihood of making a cancer attribution was independent of cancer avoidance [17]. Potential explanations for lower likelihood of mentioning cancer in response to the vignettes in the lower educated groups include lower cancer awareness [15, 16], higher fatalism [20], and wider social and cultural barriers [21]. For example, our recent qualitative work suggests that less educated women described lack of self-confidence in interpreting symptoms (e.g. “*I am not a doctor*”), as well as situational constraints (i.e. too many competing responsibilities/stimuli) [33].

Strengths and limitations

This study addresses some of the issues of previous research where there was not enough power to look at socio-demographic effects at the individual symptom level [17]. By using vignette methodology we were able to examine differences across educational groups. This approach showed that having higher education, and particularly university education, may be protective against not recognising cancer ‘warning signs’ when they arise.

The strengths of using vignette methodology were that we could explore differences in large populations without women having to report breast symptoms themselves. It also has the

advantage of controlling for symptom severity, a key factor in real world symptom appraisal [8, 34]. One weakness was that people were responding to hypothetical, rather than real-life situations. However, we followed principles of vignette design [35], and conducted extensive piloting to mitigate against these limitations as far as possible. The validity/success of this approach is demonstrated by the corroboration of our previous findings in a community based sample reporting real symptoms [17].

Another limitation is that we did not have information on non-responders. Our previous work showed that people from more deprived residential areas and younger people were less likely to respond to symptom surveys [17, 25]. As we purposively sampled women by education, age is the only potential outstanding issue in the relative estimates. In line with this, younger women (47-59 years) with no formal qualifications were harder to recruit and were therefore underrepresented in our study, although the effect of education on likelihood of mentioning cancer persisted after controlling for age.

Practical implications

Our finding that women with lower education had higher cancer avoidance, and were less likely to mention cancer as a possible cause of breast cancer symptoms is important. Public health interventions aimed at encouraging prompt presentation for signs and symptoms of breast cancer may need to focus on sub-groups of women with lower education, as well as older women in order to avoid exacerbating inequalities [36]. For example, community-based interventions, such as cancer awareness roadshows [37], that have been shown to improve awareness of cancer symptoms and positive attitudes towards help-seeking could provide effective solutions to reducing SES inequalities if targeted at socially deprived areas or by tailoring the message to address known psychological barriers (e.g. cancer avoidance). Acknowledging that there may be socio-demographic variation in attributions people make in response to cancer symptoms is also important for the clinical encounter, as GPs can have a greater sense of patients who may be normalising their symptoms [23].

Conclusion

This vignette-based survey showed that women were more likely to consider cancer as a possible cause of an axillary lump than a nipple rash. Lower education was associated with lower likelihood of making cancer attributions for both familiar (lump) and unfamiliar (rash) symptoms. Lower likelihood of considering cancer may delay symptomatic presentation by

prolonging the appraisal interval. Reducing inequalities in breast cancer may involve procuring a deeper understanding of why these differences emerge to ensure women across educational backgrounds are empowered to make decisions about the meaning and cause of breast-related symptoms.

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Conflicts of interest

Authors report none.

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Table 1 Demographic characteristics (*n* = 961)

| | Overall [<i>n</i> (%)] (<i>n</i> = 961) | Lower education [<i>n</i> (%)] (<i>n</i> = 288) | Mid education [<i>n</i> (%)] (<i>n</i> = 359) | Higher education [<i>n</i> (%)] (<i>n</i> = 314) |
|--|--|--|--|---|
| Age | | | | |
| 47-59 | 401 (41.7) | 74 (25.7) | 183 (51.0) | 144 (45.9) |
| 60-69 | 385 (40.1) | 142 (49.3) | 123 (34.2) | 120 (38.2) |
| 70+ | 175 (18.2) | 72 (25.0) | 53 (14.8) | 50 (15.9) |
| Ethnicity | | | | |
| White British | 917 (95.4) | 283 (98.3) | 345 (96.1) | 289 (92.0) |
| Other | 44 (4.6) | 5 (1.7) | 14 (3.9) | 25 (8.0) |
| Marital status | | | | |
| Married/living with partner/in civil partnership | 592 (61.6) | 182 (63.2) | 230 (64.1) | 180 (57.3) |
| Single/divorced/ separated/widowed | 369 (38.4) | 106 (36.8) | 129 (35.9) | 134 (42.7) |
| Employment | | | | |
| Working | 317 (33.0) | 53 (18.4) | 129 (35.9) | 135 (43.0) |
| Not working | 644 (67.0) | 235 (81.6) | 230 (64.1) | 179 (57.0) |

Table 2 Symptom attributions by breast cancer symptom type*~

| | Nipple Rash % (n) | Axillary lump % (n) | McNemar Test (for difference) |
|-----------------------|--------------------------|----------------------------|--|
| Physical (non-cancer) | 36.9 (360) | 63.8 (622) | p< .001 |
| Cancer | 29.8 (291) | 64.4 (628) | p < .001 |
| Environmental | 23.0 (224) | 2.6 (25) | p < .001 |
| Psychological | 0.1 (1) | 0.2 (2) | p = 1.00 |
| Don't know | 32.9 (321) | 6.6 (65) | p < .001 |
| Missing | 3.6 (35) | 4.2 (41) | p = 0.46 |

*columns do not add up to 100% because participants could cite more than one attribution.

~weighted by education

Table 3 Univariable association between education and cancer avoidance.

| | ‘I would not want to know if I have breast cancer’ | | |
|--------------------------|---|--------------|--------------------|
| | % (n)* | | OR (95% CI) |
| Education | Disagree | Agree | |
| Higher education (n=288) | 96.2 (277) | 3.8 (11) | |
| Mid education (n=325) | 92.0 (299) | 8.0 (26) | 2.19 [1.06-4.52] |
| Lower education (n=245) | 91.8 (225) | 8.2 (20) | 2.24 [1.05-4.77] |

*women endorsing ‘neither agree nor disagree’ (n=103) were excluded from this analysis

Table 4 Unadjusted and adjusted odds ratios of attributing nipple rash or axillary lump to cancer

| | | Attributing nipple rash to cancer | | | Attributing axillary lump to cancer | | |
|-------------------------|------------------------------------|-----------------------------------|-------------------------|-------------------------|-------------------------------------|-------------------------|-------------------------|
| | | % (n) | OR (95%CI) | Adj.* OR (95%CI) | % (n) | OR (95%CI) | Adj.* OR (95%CI) |
| Education | Higher education (n=314) | 40.4 (127) | | | 70.1 (220) | | |
| | Mid education (n=359) | 27.3 (98) | 0.55 [0.40-0.76] | 0.51 [0.36-0.73] | 65.5 (235) | 0.81 [0.59-1.12] | 0.79 [0.57-1.10] |
| | Lower education (n=288) | 26.0 (75) | 0.52 [0.37-0.73] | 0.55 [0.40-0.77] | 59.4 (171) | 0.62 [0.45-0.88] | 0.58 (0.41-0.83) |
| Age, years | 47-59 (n=401) | 29.7 (119) | | | 62.6 (251) | | |
| | 60-69 (n=385) | 34.5 (133) | 1.25 [0.93-1.69] | 1.30 [0.95-1.78] | 69.9 (269) | 1.40 [1.03-1.87] | 1.41 [1.03-1.92] |
| | 70+ (n=175) | 27.4 (48) | 0.90 [0.60-1.33] | 0.97 [0.64-1.47] | 60.6 (106) | 0.92 [0.64-1.32] | 1.05 [0.68-1.61] |
| Ethnicity | Other (n=44) | 22.7 (10) | | | 40.9 (18) | | |
| | White (n=917) | 31.6 (290) | 1.57 [0.77-3.23] | 1.65 [0.79-3.44] | 66.3 (608) | 2.84 [1.53-5.26] | 2.93 [1.56-5.52] |
| Marital status | Not married (n=369) | 27.6 (102) | | | 65.6 (242) | | |
| | Married/cohabiting (n=592) | 33.4 (198) | 1.32 [0.99-1.75] | 1.35 [1.00-1.81] | 64.9 (384) | 0.97 [0.74-1.27] | 0.95 [0.72-1.26] |
| Cancer avoidance | Disagree (n=801) | 33.8 (271) | | | 67.2 (538) | | |
| | Neither agree nor disagree (n=103) | 18.4 (19) | 0.44 (0.26-0.74) | 0.49 [0.29-0.83] | 51.5 (53) | 0.52 [0.34-0.78] | 0.57 [0.37-0.86] |
| | Agree (n=57) | 17.5 (10) | 0.42 (0.21-0.84) | 0.44 [0.22-0.90] | 61.4 (35) | 0.78 [0.45-1.35] | 0.81 [0.46-1.41] |

*Adjusted for all other variables reported in the table. Bold figures are statistically significant. OR= odds ratio, CI=confidence interval.